ABSTRACT OF THE DISCLOSURE

A diamond semiconductor includes a high-quality thin diamond film layer with few crystal defects and few impurities, implanted with ions of dopant elements and controllable in conductivity determined by a kind and a concentration of the dopant elements. The diamond semiconductor is fabricated by a method including the step of implanting ions of dopant elements into a high-quality thin diamond film layer with few crystal defects and few impurities under conditions that can attain given distribution of concentrations of the dopant elements and with the high-quality thin diamond film layer kept to a temperature in accordance with the conditions so as not to be graphitized, to thereby enable the diamond semiconductor to have conductivity determined by a kind and a concentration of the dopant elements.